

CLAIMS

- 1 1. A vacuum pumping system comprising a pump having an inlet for receiving
2 from a vacuum chamber at least a first gas to be pumped; means for supplying a
3 second, purge gas to be pumped with the first gas; the pump having an outlet for
4 exhausting a gas stream comprising the first gas and the purge gas; and gas
5 separating means for receiving the gas stream and recovering the purge gas from
6 the stream, the supply means being arranged to receive from the gas separating
7 means the recovered purge gas.
- 1 2. The system as claimed in claim 1, wherein the supply means is arranged to
2 supply the purge gas directly to the pump.
- 1 3. The system as claimed in claim 1, wherein the supply means is arranged to
2 supply the purge gas to the vacuum chamber.
- 1 4. The system as claimed in claim 1, comprising a second pump having an
2 inlet for receiving the gas stream from the first-mentioned pump and an outlet for
3 exhausting the gas stream to the gas separating means.
- 1 5. The system as claimed in claim 1, comprising a second pump having an
2 inlet for receiving the recovered purge gas and an outlet for exhausting the
3 recovered purge gas to the conveying means.
- 1 6. The system as claimed in claim 5, comprising means for purifying the gas
2 exhaust from the second pump.
- 1 7. The system as claimed in claim 1, comprising first gas recirculating means
2 for recirculating first gas from the separating means to the vacuum chamber.

- 1 8. The system as claimed in claim 7, wherein the recirculating means
2 comprises means for purifying the received first gas.
- 1 9. The system as claimed in claim 8, wherein the recirculating means
2 comprises means for pressurising the received first gas.
- 1 10. The system as claimed in claim 9, wherein the separating means comprises
2 cryogenic separating means for separating cryogenically the first gas from the gas
3 stream to recover both the first and second gases.
- 1 11. The system as claimed in claim 10, wherein the cryogenic separating
2 means is arranged to condense the first gas without condensing the second gas.
- 1 12. The system as claimed in claim 1, wherein the first pump comprises a
2 turbo-molecular pump.
- 1 13. The system as claimed in claim 1, wherein the first gas comprises a low
2 thermal conductivity gas.
- 1 14. The system as claimed in claim 13 wherein said low thermal conductivity
2 gas is selected from the group consisting of xenon and argon.
- 1 15. The system as claimed in claim 1, wherein the purge gas is lighter than the
2 first gas.
- 1 16. The system as claimed in claim 15, wherein the purge gas comprises one of
2 helium and nitrogen.
- 1 17. A vacuum pumping system, comprising first gas supply means for supplying
2 a first gas to a vacuum chamber; a pump arranged to receive at least the first gas
3 from the chamber; second gas supply means for supplying a second gas for

4 pumping with the first gas; and gas separating means for receiving a gas stream
5 output from the pump, recovering the first and second gases from the gas stream,
6 outputting the recovered first gas to the first gas supply means for recirculation
7 through at least the chamber and outputting the recovered second gas to the
8 second gas supply means for recirculation through at least the pump.

1 18. An extreme ultra violet lithography apparatus comprising a vacuum
2 pumping system as claimed in claim 1.

1 19. A method of vacuum pumping, comprising receiving at a pump at least a
2 first gas from a vacuum chamber, and a second, purge gas for pumping with the
3 first gas; exhausting from the pump a gas stream comprising the first and second
4 gases; recovering the second gas from the stream and recirculating the second
5 gas through at least the pump.

1 20. The method as claimed in claim 19, wherein the second gas is recirculated
2 through both the vacuum chamber and the pump.

1 21. The method as claimed in claim 19, wherein the pressure of the gas stream
2 exhausted from the pump is increased prior to the recovery of the second gas
3 therefrom.

1 22. The method as claimed in claim 19, wherein the pressurised gas stream is
2 purified prior to the recovery of the second gas stream therefrom.

1 23. The method as claimed in claim 19, wherein the pressure of the recovered
2 second gas is increased prior to its recirculation.

1 24. The method as claimed in claim 23, wherein the pressurised, recovered
2 second gas is purified prior to its recirculation.

1 25. The method as claimed in claim 19, wherein the first gas is recovered from
2 gas stream and recirculated to the vacuum chamber.

1 26. The method as claimed in claim 25, wherein the recovered first gas is
2 purified prior to its return to the vacuum chamber.

1 27. The method as claimed in claim 26, wherein the recovered first gas is
2 pressurised prior to its return to the vacuum chamber.

1 28. The method as claimed in claim 19, wherein the first gas is cryogenically
2 separated from the gas stream to recover the first and second gases.

1 29. The method as claimed in claim 28, wherein the first gas is condensed
2 without condensing the second gas to separate the first and second gases.

1 30. The method as claimed in claim 19, wherein the first gas comprises a low
2 thermal conductivity gas.

1 31. The method as claimed in claim 30 wherein said low thermal conductivity
2 gas is selected from the group consisting of xenon and argon.

1 32. The method as claimed in claim 19, wherein the second gas is lighter than
2 the first gas.

1 33. The method as claimed in claim 19, wherein the second gas comprises one
2 of helium and nitrogen.